23. The article of claim 15, wherein an index is used to represent each frame in the frame dependency.

24. The article of claim 15, wherein the frame dependency is determined through a look-up table.

25. The article of claim 24, wherein the frame dependency is determined through successive uses of a look-up table.

A3

D1

26. (Amended) A computer system including:

a processor and video processing circuitry;

a display; and

memory including instructions which when executed cause the processor and video processing circuitry to:

(a) detect a request to playback a particular frame; and

(b) determine whether a decoded version of the particular frame is in a decoded frame cache, and if it is not and if the particular frame has a frame dependency:

(i) determine a frame dependency for the particular frame;

(ii) determine which of the frames in the frame dependency are in the decoded frame cache;

(iii) decode any frame in the frame dependency that is not in the decoded frame cache and place it in the decoded frame cache; and

(iv) use at least and of the decoded frames in the frame dependency to decode the particular frame to create a decoded version of the particular frame.

(c) provide the decoded version of the particular frame for displaying on the display.

REMARKS

Claims 1-26 are in the application of which claims 1, 15, and 26 are in independent form.

Claims 1-8, 10-13, 15-21 & 23-26 stand rejected under 35 U.S.C. § 102(e) for anticipation by Patent 5,959,690 to Toebes, VIII (hereinafter "Toebes"). Applicants respectfully traverse this rejection.

Amendment to claims

Claims 1, 15, and 26 are amended to more avoid a possible misunderstanding and make the

claims more clearly conform to the specification. As stated in the specification at page 5, lines 22-26:

"MPEG-1 and MPEG-2 video are made up of three basic frame types: I frames, P frames and B frames. I frames are coded independently of other frames. P frames are coded based on the previous I or P frames. B frames are also known as Bi-directional frames and are coded based on the previous and/or next I or P frames. For MPEG-2 video coded using field coding, B frames may also depend on a different field coded as a B frame."

The claims are amended to clarify that some frames (e.g., I frames) do not have a frame dependency. Accordingly, in such a case, the claims do not require that the frame dependency be determined. Of course, the claims do not forbid that it could be determined that there is no frame dependency for some frames. Further, some frames might be dependent on only one other frame.

Difference between the claims and Toebes

The primary difference between the claims 1, 15, and 26 and Toebes are that claims 1, 15, and 26 recite a "decoded frame cache" and Toebes does not include the decode frame cache. Rather, Toebes includes past and future buffers which have been long used in MPEG.

The decoded frame cache of the invention is designed to hold many decoded frames. For example, the specification, page 7, line 22 - page 8, line 3 states:

"The decoded frames are stored in a decoded frame cache. Various types of memory may be used for the decoded frame cache. Main memory dynamic random access memory (DRAM) is an example. Video random access memory (VRAM) may also be used. A separate memory or section of memory could be dedicated solely to holding the decoded frames. The decoded frame cache does not have to be all in contiguous locations.

The decoded frames cache may be a fixed or variable size. If it is of fixed size it should be large enough to hold the minimum number of decoded frames needed considering the GOPs that may be encountered. The size could dynamically change if the number of frames in the GOP changes. Under one approach, the decoded frames cache is of a fixed size and a when the cache is full, a Least Recently Used (LRU) replacement policy is used to replace the frame that has been least recently accessed. If the cache is not of a fixed size, it could hold a fixed number of frames and a LRU replacement policy could be used."

The specification, page 8, lines 15-22 states:

"Random access can also be more effectively performed using the above described frame caching technique used in backward playback. The key is to use the same caching mechanism for storing recently decoded frames and to re-use these frames if they are requested in the near future. For instance, the following set of frames may be requested to be decoded: I1, B3, B5. To decode B3, both P1 and P2 are needed. As a result, P1, P2 and I1 will be decoded and placed in the decoded frame cache and used from the decoded frame cache if they were already there. In the next

request to decode B5, which depends on P2 and I2, only I2 needs to be decoded since P2 is already in the cache."

Such a decoded frame cache is not taught by Toebes. The Office action, p. 3, cites Toebes, col. 15, line 24 to col. 16, line 37 in support of the anticipation rejection. Col. 15, line 51 to col. 16, line 37 of Toebes states:

"Once the player is placed in the proper state, the display and audio are enabled and the system begins normal play at its current position. As the three alternatives in FIG. 8 illustrate, the bitstream position varies depending on the type of target frame. For B frames the MPEG streamer is directed to skip or seek to the beginning of the target B frame once the preceding (in bitstream order) reference frames are parsed. Then the display is enabled and normal play is began. As B frames are displayed immediately as parsed, the B frame will be parsed and displayed immediately upon resumption of normal play. The appropriate I and P frames necessary to place the player in the appropriate state to accurately parse the B frame will have already been parsed into the appropriate buffers so that, once normal play is resumed, the B frame will be displayed as it is parsed.

Under normal MPEG player playing conditions reference frames, either I or P, will not be displayed when initially parsed. Rather, reference frames are first parsed into the future buffer where they are used, along with the reference frame in the past buffer, to decode any intermediate B frames. The reference frame is not displayed until another reference frame is parsed into the future buffer, forcing the parsed reference frame into the past buffer and simultaneously displaying it.

The current invention takes advantage of this characteristic of MPEG players. Recall that P frames are dependent on the reference frame in the past buffer for accurate decoding. If the frame in the past buffer is a P frame, it in turn is dependent on any previous P frames between it and the closest previous I frame. Therefore, in order to have the past buffer in the proper state to parse the target P frame, the MPEG streamer is directed to skip or seek to the most recent previous I frame which it sends to the player, then it sends in normal order all P frames between the I frame and the target P frame. Of course, if the streamer/player is not capable of skipping, all intermediate frames can be parsed while the player is in suppression mode as the streamer/player combination seeks toward the target frame. The target P frame is then parsed into the future buffer and the player/streamer instructed to skip or seek to the next reference frame. The display is enabled and normal play is resumed at this position. Immediately upon the resumption of normal play, the next reference frame is parsed into the future buffer, forcing the target frame into the past buffer and simultaneously displaying it." (Emphasis added.)

There is no discussion there of a decoded frame buffer like that of the present invention. Accordingly, the rejection should be withdrawn.

There are additional reasons why the dependent claims are allowable over Toebes, but an explanation of these is not necessary in light of the independent claims being allowable.

Claims 9 and 22 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Toebes

Proctor is provided only to teach an LRU policy. Accordingly, claims 9 and 22 should be allowed.

Applicant believes the application is in condition for allowance and respectfully requests the same.

Respectfully submitted,

Dated: May 2, 2002

Alan K. Aldous
Reg. No. 31,905

Blakely, Sokoloff, Taylor & Zafman
12400 Wilshire Boulevard, Seventh Floor
Los Angeles, California 90025-1026
Phone: (503) 264-7125
Phone: (503) 684-6200
Phone (310) 207-3800
Facsimile: (503) 684-3245